



**EXPLANATION OF MINERAL RESOURCE DATA**  
[Prospects, mineral occurrences, claims, and resource tracts referred to in text and tables]

- X Prospect-X indicates locality uncertain
- ◆ Mineral occurrence
- ◆ Placer claim-Line indicates length of stream course prospected
- ▲ Pumice claim
- Mineral Resource Tract-Dashed(?) lines divide subtracts

**EXPLANATION OF AEROMAGNETIC DATA**  
—3000— Magnetic contour—Showing residual magnetic field; contour interval 100 nanotesla; hatched where contours enclose a low

(V<sub>4</sub>) Magnetic anomaly—Discussed in text

**DESCRIPTION OF MAP UNITS**

**SURFICIAL DEPOSITS AND SEDIMENTARY ROCKS**

Qs Surficial deposits (Holocene and Pleistocene)—Unconsolidated to poorly consolidated alluvial, colluvial, glacial, marine, lacustrine, and eolian deposits. Locally includes extensive redeposited pumice and ash from the Novarupta eruption

Qls Landslide deposits (Holocene and Pleistocene)—Nonstratified, coarse angular rubble forming lobate masses

Ts Sedimentary rocks (Tertiary)—Poorly to moderately well indurated, fluvial sandstone, siltstone, tuff, and conglomerate; larger clasts consist of locally derived plutonic and volcanic rocks

Th Hemlock Conglomerate (Oligocene)—Poorly indurated fluvial conglomerate, pale-brown tuffaceous sandstone, siltstone, shale, coal, and tuff. Age is late Oligocene

Tc Copper Lake Formation (Eocene and Paleocene)—Well-indurated, polymictic conglomerate, sandstone, and siltstone

Kk Kaguyak Formation (Late Cretaceous)—Upper part consists of interbedded siltstone and graded graywacke sandstone that represent the upper and middle stages of a submarine fan. Lower part consists of thinly bedded siltstone and some thin limestone beds and includes abundant ammonites, bryozoans, and limestone concretions

Kp Podiat Formation (Early Cretaceous)—Thick-bedded, gray sandstone and minor amounts of siltstone and shale that contain ammonites of Albian age

Kh Hecund Formation (Early Cretaceous)—Calcareous sandstone and interbedded siltstone, thinly bedded, light- to dark-olive gray

Ks Stanikovich Formation (Early Cretaceous)—Siltstone, shale, and thinly bedded, fine-grained, feldspathic, brown sandstone

Jh Naknek Formation (Late Jurassic)—Main sedimentary rock unit of the map area, consisting of sandstone, conglomerate, siltstone, and dark shale. Divided into five members (not mapped here), from oldest to youngest: massive nonmarine conglomerate and thinly bedded sandstone member; thick-bedded to massive sandstone member; thinly bedded, dark-gray marine siltstone member with limestone concretions; thinly bedded marine sandstone and siltstone member; massive conglomerate member. Conglomerate in both the oldest and youngest members are metamorphic, volcanic, and sedimentary rocks with subordinate plutonic rocks

Tu Ryapayal intrusive rocks, undivided (Tertiary)—Intrusive bodies ranging from small plugs and sills to plutons exposed over as much as 10 km<sup>2</sup>. Rocks are fine- to medium-grained, commonly porphyritic, and consist chiefly of quartz diorite or tonalite

Tgd Grandiorite (Tertiary)—Medium-grained equigranular to marginally porphyritic rocks in which modal quartz rarely exceeds 25 percent; unit includes rocks that are mineralogically classified as quartz monzonite or quartz diorite. Age is here considered to be middle Tertiary

Tqd Quartz diorite (Tertiary)—Medium-grained equigranular rocks in which accessory hornblende exceeds biotite; also occurs as zones within intrusions of grandiorite (Tgd). Age is here considered to be middle Tertiary

Tk Kamishak Formation (Late Triassic)—Slightly recrystallized, nonfossiliferous limestone and interbedded basalt flows and breccia

**VOLCANIC DEPOSITS AND ROCKS**

Qap Pyroclastic-flow deposits (Holocene)—Poorly sorted, variably indurated deposits of ash, vitrophyric blocks, and (or) pumiceous lapilli of the 1912 ash flow of Novarupta and the Holocene block-and-ash flows of Kaguyak caldera

Qad Domes (Holocene)—Domes of dacitic or rhyolitic composition

Qac Younger central-vent deposits and rocks (Holocene and Pleistocene)—Lava flows, tuffs, and breccias of andesitic composition but locally including lava flows of low-silica dacitic composition, airfall deposits of andesitic to rhyolitic composition on Broken Mountain and Broken Mountain, and scoria cones of basaltic composition

QTap Pyroclastic-flow deposits (Pleistocene and late Tertiary)—Poorly sorted, variably indurated deposits of ash, vitrophyric blocks, and (or) pumiceous lapilli. Primary compositions are uncertain because of alteration but probably range from andesitic to dacitic

**QTac** Older central-vent deposits and rocks (Pleistocene and late Tertiary)—Lava flows, breccias, and domes of andesitic and dacitic composition. Locally moderate to extensive alteration associated with fossil fumaroles (discharging to light-red or yellow shades)

**Tab** Volcanic rocks of Barrier Range (late Tertiary)—Breccias, lava flows, sills, and local pyroclastic and epiclastic tuffs of late Tertiary volcanic field located southward of the Aleutian Range crest and extending from the Katmai River to Naknek Bay. Dominantly of andesitic and dacitic composition. Prophyritic alteration is extensive and argillite or pumice alteration is locally intensive, such as near contacts with hypabyssal intrusive rocks (Ti)

**Tvb** Basaltic lava (early Tertiary)—Plugs, dikes, and flows of basaltic composition that intrude or overlie andesitic and dacitic lava flows and breccia (Tva)

**Tva** Andesitic and dacitic lava flows and breccia (early Tertiary)—Thin also includes local domes or tuffs of rhyolite(?) composition, now altered to quartz and sericite or kaolinite

**Tbc** Cottonwood Bay Greenstone (late Triassic)—Slightly metamorphosed basalt; locally includes fine- to medium-grained diabase sills(?)

**Td** Dikes (Tertiary)—Dikes from 1-m to 20-m wide that occur mainly southeast of the Bruin Bay fault and have a northwest trend. Many are in rocks as young as the Hemlock Conglomerate (Th), suggesting that most dikes are middle to late Tertiary in age

**Ti** Hypabyssal intrusive rocks near Shelikof Strait (late Tertiary)—Sill-like or cross-cutting subvolcanic intrusive bodies generally less than 10 km<sup>2</sup> in outcrop area, as well as larger plutonic bodies such as those beneath Porcupine Volcano or along the Aleutian Range crest east of Serpent Tongue Glacier. Fine-grained, porphyritic to equigranular rocks that consist dominantly of grandiorite or tonalite and minor quartz diorite

**Tu** Ryapayal intrusive rocks, undivided (Tertiary)—Intrusive bodies ranging from small plugs and sills to plutons exposed over as much as 10 km<sup>2</sup>. Rocks are fine- to medium-grained, commonly porphyritic, and consist chiefly of quartz diorite or tonalite

**Tgd** Grandiorite (Tertiary)—Medium-grained equigranular to marginally porphyritic rocks in which modal quartz rarely exceeds 25 percent; unit includes rocks that are mineralogically classified as quartz monzonite or quartz diorite. Age is here considered to be middle Tertiary

**Tqd** Quartz diorite (Tertiary)—Medium-grained equigranular rocks in which accessory hornblende exceeds biotite; also occurs as zones within intrusions of grandiorite (Tgd). Age is here considered to be middle Tertiary

**Tk** Kamishak Formation (Late Triassic)—Slightly recrystallized, nonfossiliferous limestone and interbedded basalt flows and breccia

**Tgb** Gabbro and diorite (Tertiary)—Medium-grained rocks having gabbroic or dioritic textures. Age is here presumed to be middle Tertiary

**Jgr** Granite (Jurassic)—Medium-grained equigranular or fine-grained porphyritic rocks in which biotite exceeds hornblende

**Jgd** Grandiorite (Jurassic)—Medium-grained equigranular or fine-grained porphyritic rocks. Also includes isolated outcrops of tonalite and quartz diorite. Modal quartz is 22-44 percent of rock

**Jqd** Quartz diorite and tonalite (Jurassic)—Medium-grained equigranular rocks having accessory biotite; unit includes some grandiorite

**Jkd** Diorite and gabbro (Jurassic)—Dark, diabasic- and gabbroic-textured rocks

**Jgk** Kakhonak Complex (Jurassic, Triassic, and Paleocene?)—Locally foliated or banded quartzite, schist, amphibolite, and garnet-bearing gneiss indicative of amphibolite-facies metamorphism. Protoliths presumably consist of the Talkeetna Formation (Jh), Kamishak Formation (Tk), Cottonwood Bay Greenstone (Tbc), and unnamed sandstone and argillite

**GEOLOGIC MAP SYMBOLS**

Contact-Dashed where inferred or approximately located; queried where uncertain

Fault-Dashed where inferred or approximately located, dotted where concealed; queried where uncertain. U, upthrown side; D, downthrown side; query next to U or D indicates direction of movement uncertain; arrows indicate direction of relative movement

Thrust or reverse fault-Surface on upper plate; bar with number indicates dip of fault plane

Anticlinal axis—Showing direction of plunge; dashed where approximately located; dotted where concealed; queried where existence uncertain

Synclinal axis—Showing direction of plunge; dashed where approximately located; dotted where concealed; queried where existence uncertain

Measured strike and dip of beds

Approximate strike and dip of beds

Strike and dip of foliation

Horizontal bedding

Quaternary volcanic vent

Area of alteration

Area of hornfels

Area covered by glacier

Table 1.—Mineral prospects and occurrences in the Mount Katmai, Naknek, and western Afofnaquadrangles, Alaska

Interpreted by hand specimen identification: py, pyrite; cpy, chloropyrite; spl, sphalerite; gn, galena; bar, barite; mly, molybdenite; tt, tetrahedrite; disse, disseminated mineral grains in sample

Map Locality or No.	Locality or No.	Latitude	Longitude	Geologic description	Commodity	References
1	Kashik Volcano	58°00' N	155°39' W	Silicified volcanic rocks; containing both vein and Cu disse, py, Cu, Mo, S, Zn anomalies; py, bar, cpy, spl seen in banded conglomerates	Cu	Church, Wetters, and Wilson (1988); Church and others (in press)
2	Windy Creek	58°14' N	155°39' W	Large breccia body exposed in cliff wall; contains anomalous Pb, Zn. Breccia body estimated to be 10 by 30 m.	Pb, Zn	py
3	Margot Creek	58°18' N	155°39' W	Quartz veins carrying py and cpy at margin of pluton; Tertiary pluton containing vuggy quartz veins containing fine-grained py, Au, and in pellets altered core in pluton.	Cu, Mo	Church, Wetters, and Wilson (1988); Church and others (in press)
4	Kaguyak Creek	58°20' N	155°39' W	Small quartz veins bearing py and cpy exposed in pluton; Tertiary pluton containing vuggy quartz veins containing fine-grained py, Au, and in pellets altered core in pluton.	Au, Pb, Zn, Cu, cpy	py, cpy, spl, py
5	Kukuk Lake	58°21' N	155°39' W	Quartz veins containing fine-grained py, Au, and in pellets altered core in pluton.	Au, Cu	py
6	Kukuk Kopper	58°21' N	155°39' W	Quartz veins bearing py and cpy exposed in pluton; Tertiary pluton containing vuggy quartz veins containing fine-grained py, Au, and in pellets altered core in pluton.	Cu	py, cpy
7	Daisy Peak	58°21' N	155°39' W	Quartz veins bearing py and cpy exposed in pluton; Tertiary pluton containing vuggy quartz veins containing fine-grained py, Au, and in pellets altered core in pluton.	Cu, Zn, Ag	py
8	Huamut	58°21' N	155°39' W	Quartz veins bearing py and cpy exposed in pluton; Tertiary pluton containing vuggy quartz veins containing fine-grained py, Au, and in pellets altered core in pluton.	Cu, Zn, Ag	py
9	Kamut	58°21' N	155°39' W	Quartz veins bearing py and cpy exposed in pluton; Tertiary pluton containing vuggy quartz veins containing fine-grained py, Au, and in pellets altered core in pluton.	Cu	py
10	W. Douglas	58°21' N	155°39' W	Quartz veins bearing py and cpy exposed in pluton; Tertiary pluton containing vuggy quartz veins containing fine-grained py, Au, and in pellets altered core in pluton.	Au, Ag	py
11	Big River	58°21' N	155°39' W	Quartz veins, as much as 6 cm in width, exposed in Tertiary pluton in creek drainage.	Cu, Mo	py
12	Kakuk Bay	58°21' N	155°39' W	Locality not found; no anomalies found in this area. Quartz veins bearing py and cpy exposed in pluton; Tertiary pluton containing vuggy quartz veins containing fine-grained py, Au, and in pellets altered core in pluton.	Cu, Au, Ag	py
13	Kaguyak Pass	58°21' N	155°39' W	Quartz veins, as much as 6 cm in width, exposed in Tertiary pluton in creek drainage.	Au, Ag, Mo	py
14	Kakuk Lake	58°21' N	155°39' W	Quartz veins, as much as 6 cm in width, exposed in Tertiary pluton in creek drainage.	Au	py
15	Suluk River	58°21' N	155°39' W	Quartz veins, as much as 6 cm in width, exposed in Tertiary pluton in creek drainage.	Zn, As, Cu	py, spl
16	Kakuk Bay	58°21' N	155°39' W	Quartz veins, as much as 6 cm in width, exposed in Tertiary pluton in creek drainage.	Cu	py
17	Amuk Harbor	58°21' N	155°39' W	Quartz veins, as much as 6 cm in width, exposed in Tertiary pluton in creek drainage.	Au	py

Table 2.—Placer occurrences in the Mount Katmai, Naknek, and western Afofnaquadrangles, Alaska

Map Geographic No.	Locality	Latitude	Longitude	Commodities	Claim description	Exploration History	References
18	Reefers Bar	58°05' N	155°45' W	Au	Undeveloped claim; flour gold panned from bar in the Naknek River.	No production	Mertie (1938); Cobb (1972, 1977, 1980); MacKevett and Holloway (1977).
19	Kegikik Beach	58°05' N	155°45' W	Au, Ti, Fe	Flour gold in titaniferous magnetite-rich stream bed as shown on map. Alternates names: D. F. Huber, 1950; unpub. data (1987).	USNM studies indicate 2-40 kg Au/m <sup>2</sup> ; 0.7-1.1 kg Ti/m <sup>2</sup> , and 0.1 g Au/ton.	Berryhill (1963); Cobb (1972, 1973, 1980); MacKevett and Holloway (1977); D. F. Huber, 1950; unpub. data (1987).
20	Tri Beauty #9	58°08' N	155°45' W	Au	Undeveloped claim filed on small tributary of King Salmon River.	Active claim, no production	USNM claim files (1990).
21	Gas Creek	58°02' N	155°45' W	Au	Gold panned from stream gravels along stream bed as shown on map.	No production	-----Do-----
22	Superior Association	58°02' N	155°45' W	Au	Undeveloped claim.	-----Do-----	-----Do-----
23	American Creek	58°05' N	155°45' W	Au	Gold panned from gravels for 10 km along stream bed as shown on map. Alternates names: Alex Grant, Wm. Hamersly, 1950; unpub. data (1987).	Claim filed in 1918, worked through 1944; no production records.	-----Do-----
24	Nix	58°05' N	155°45' W	Au	Gold in stream placers at contact between Talkeetna Formation and Tertiary granodiorite.	No production.	MacKevett and Holloway (1977); Cobb (1980).
25	Cottonwood Creek	58°05' N	155°45' W	Au	Placer gold from sediment in stream draining Talkeetna Formation on Oakley Peak.	-----Do-----	USNM claim files (1990).
26	Gorge Creek	58°05' N	155°45' W	Ag	Climax reportedly panned from stream gravels; unable to verify during field study.	-----Do-----	USNM claim files (1990); Roehn (1941) unpub.
27	Kamishak River	58°02' N	155°45' W	Pumice	Small tributary on west side of Kamishak River.	-----Do-----	USNM claim files (1990).
28	Kukuk Bay	58°21' N	155°39' W	Pumice	Exact location uncertain; undeveloped claim.	-----Do-----	-----Do-----
29	Hidden Harbor	58°13' N	155°45' W	Pumice	Undeveloped claim.	-----Do-----	-----Do-----
30	Geographic Harbor	58°02' N	155°45' W	Pumice	-----Do-----	-----Do-----	USNM claim files (1990); Moehs (1951); Roehn (1941) unpub. report; Roehn and Pfister (1959).
31	Takli Island	58°04' N	155°45' W	Pumice	-----Do-----	-----Do-----	USNM claim files (1990); Moehs (1951); Rutledge (1959); Roehn (1941) unpub. report.
32	Katmai River	58°02' N	155°45' W	Pumice	-----Do-----	-----Do-----	USNM claim files (1990); Moehs (1951).